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Clinical Proceedings

OF THE

CHILDREN'S HOSPITAL

WASHINGTON, D.C.

THE ROLE OF A CHILDREN'S HOSPITAL
Waldo E. Nelson, M.D. 269

A PEDIATRIC APPROACH TO THE FEET AND LEGS
John Tkach, M.D. 273

HERPETIC GINGIVOSTOMATITIS AND NECROTIZING ULCERATIVE GINGIVITIS IN THE CHILD AND ADOLESCENT
Spencer N. Frankl, D.D.S. 282

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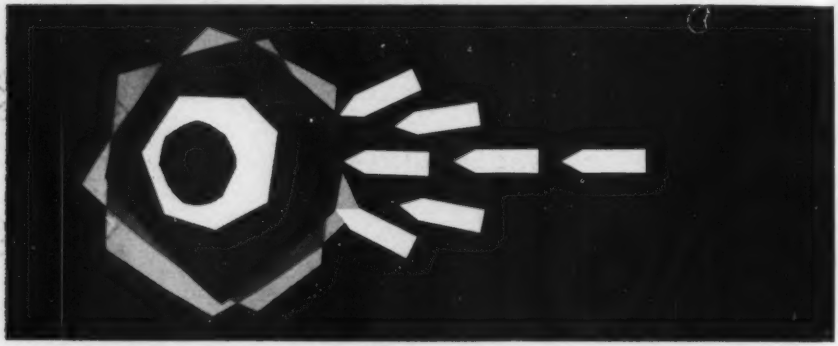

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references: (1) Clinical Research Division, Mead Johnson & Company. (2) Howell, C. M., Jr.: Evaluation of Methdilazine Hydrochloride as an Antipruritic Agent, North Carolina M. J. *21* (May) 1960 (in press). (3) Wahner, H. W., and Peters, C. A.: An Evaluation of Some Newer Antihistaminic Drugs Against Pollinosis, Proc. Staff Meet. Mayo Clin. *35*:161-169 (March 30) 1960.

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PUBLISHED MONTHLY BY THE STAFF AND RESEARCH FOUNDATION OF THE CHILDREN'S HOSPITAL, WASHINGTON, D. C.

Cases are selected from the weekly conferences held each Friday at 12:30 P.M., from the Clinico-pathological conferences and from weekly Staff meetings.

This bulletin is printed for the benefit of the present and former members of the Attending and Resident Staffs, and the clinical clerks of Georgetown and George Washington Universities.

Subscription rate is $3.00 per year. Those interested make checks payable to "Clinical Proceedings Dept.," The Children's Hospital, Washington, D. C. Please notify on change of address.

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The Role of a Children's Hospital*

WALDO E. NELSON, M.D.**

It is meaningful to take cognizance of people such as Dr. Edgar P. Copeland who have given so much of themselves to community service. It seems especially meaningful that the topic for this evening has been selected as the first in a series of lectureships to honor a person who has given his life to children and to a children's hospital. Whenever I have met Dr. Copeland I have always been aware of this devotion. He has the kind of philosophy which permits identification without too much of identity and a "feet on the ground" type of realism coupled with a capacity to see over the hill and to recognize the "handwriting on the wall." Dr. Copeland, I am humble in the privilege to be here tonight to share in doing honor to you.

How can we examine the subject of the evening, "The Role of a Children's Hospital?" I am no guide or prophet, and as one who has unsolved problems at home, I would not have the effrontery and pretense to come and attempt to solve my neighbors'. The most we can do is examine together our mutual problems.

Traditionally, the role of the children's hospital has been the care of sick children, but within the past half century increasing emphasis has been placed on the prevention of disease, both physical and behavioral, and especially in family guidance in health matters. Today it is essential that the children's hospital shares responsibility for the teaching of pediatrics, for research, and for provision of services in such a way that it is a demonstration facility for other child-caring agencies.

Some will ask what is the relative importance of the various roles? Which comes first—service to patients, or teaching and research? This question may bother some persons. I think it need not, since in the strictest sense there is no real issue. Service to patients must come first. But there is a further question: By what means, in what kind of an environment and in what setting does one achieve the best care? Here, I think, is the important issue. I challenge you to the thought that the best kind of medical care is carried out in a setting where teaching and research are considered essential to the activity of the pediatric institution.

* First Annual Edgar Copeland Lectureship, delivered at Children's Hospital March 21, 1960.

** Professor of Pediatrics, Temple University School of Medicine; Medical Director, St. Christopher's Hospital for Children, Philadelphia.

Whereas in earlier days teaching was limited to ward patients, private patients in a teaching institution must now be included in the educational program; all patients must be included. Such a program is possible if we, as physicians, have the capacity to say "I don't know" to our private patients, to understand our limitations of the moment, and to recognize the need for objective teaching and for research. Rarely do private patients object to their inclusion in a teaching program.

I suspect that the best critique we have of medical care is that of a zealous student and a critical faculty. The kind of medical care that should be provided is that which is good enough for teaching purposes. Thus, I think one can, with confidence, say to the layman as well as to the private physician that he need have no fear that medical teaching will hamper the medical care of any patient, but rather that it has the potential to improve it.

From the standpoint of service to patients, a hospital such as this one has principally two functions: on the one hand the hospital must be the pediatrician to the community for those children whose parents cannot afford to pay for their care. These services include both outpatient and inpatient ones, both preventive and therapeutic, and with particular emphasis on guidance in family living. This broad kind of care needs to be provided through an institution such as this one, not only because the community needs it, but also because it is essential for the teaching of young physicians who are to provide the child care of tomorrow. In this respect we should recognize the growing importance of the outpatient department. Here we see the commoner problems of pediatrics, the ones which have been so frequently neglected in the past in our teaching programs.

The second role of the children's hospital in service to patients is that of consultant and special therapist. A fair percentage of the cases that come to the hospital are referred by doctors beyond its immediate staff, from other hospitals, and from other geographic areas. The inpatient service is becoming increasingly weighted with real problem cases. It is possible for the hospital to fulfill its function as a consultant only as it has physicians on its staff with particular training in the various subspecialties of pediatrics, and only if the institution is considered primarily an educational institution. Furthermore, I do not believe that it can be primarily an educational institution unless research is considered to be more than a nicety. You must have the kind of physicians who are determined to do research and you must make it possible for them to do it.

Another responsibility of a children's hospital is to provide the highest quality of pediatric care so that it may serve as a demonstration center

for other hospitals and clinics and for all doctors. Your institution will have its greatest effect on total pediatric care through the quality of its service to patients rather than through the quantity of such care. This hospital cannot provide care for all the children of this area, but it should be the major teaching and demonstration center, serving as a bellwether to other agencies in the community.

The operation of a children's hospital as part of a teaching and research program is expensive, and I would say to the president of your Board, who sits here before me, that he must make the community aware of the need and of their responsibility to finance the hospital. There is a definition of the word "profession" as a group of people who have a common interest in a particular problem and who are working to eliminate the problem and hence the need for their particular vocation. Basically this should be true of a children's hospital and of the pediatrician. We should be working to eliminate the need for our services. This goal need worry none of us here this evening. There are no reasons to assume such a degree of success in the foreseeable future.

There is little likelihood that a children's hospital can become a strong teaching and research unit except as it is an integral part of a medical school. If one accepts this conclusion then one must ask whether this can be accomplished with more than one school. Secondly, is it practical for students to travel from the central unit of their school to a remote hospital such as this one? Clearly, it would be ideal if the children's medical center could be located adjacent to a medical school, but where it is not, I believe it is infinitely better to have a complete children's medical unit in a removed location than to have only incomplete facilities at the medical school site. There may be some fear on the part of a hospital that it may lose its identity. Experience has indicated that this is not only unlikely, but rather that the hospital in effect becomes an integral part of the medical school as its pediatric department.

Now, what arrangements can be made where there is only one children's hospital and two or more medical schools? First, I think you must have a unified staff. I believe this is possible. There must be a physician-in-chief or medical director—the title is unimportant. I suppose it would be possible for this person to be the professor of pediatrics in one of the schools. It is also possible that he might hold a professorship in both schools in order to keep a balance. Then there must be full time staff members, fully paid physicians in addition to the voluntary members. There may also be need for part time salaried persons. If there are two schools there ought to be at least four full time people in general pediatrics, one for each school in charge of an inpatient service and one for each school in charge of an

outpatient service. I believe, in most situations, residents could rotate so that they would serve with the staffs of both schools at different times. In addition, there must be full time physicians with specialized interests, for example in endocrinology, cardiology, hematology, and neurology. More and more, such staff members will be essential, because an increasing number of patients will come from Maryland, Virginia, and other states for services that they cannot and should not expect to find at home. These staff members perhaps could hold dual university appointments or, if each school had its own staff of specialists, they could also be on the staff of the hospital of their respective medical schools.

We have talked mainly of full time medical staff members. However, I do want to emphasize that the man in practice is equally important for the teaching program. The man in practice will, as a rule, serve best in a teaching role in the outpatient department. The clinic is rapidly being recognized as the principal site for pediatric teaching. There should be a full time medical director of the outpatient service who will serve as coordinator and teacher, but most of the teachers should be staff members who are in private practice.

Should the medical staff be an "open" or "closed" one? You can provide an increasing service to the community if your staff is open to a relatively large number of physicians. However, an institution cannot afford to do this as a teaching institution except as it has a strong nucleus of full time members with whom the resident staff has close contact and who, in turn, provide the critical atmosphere for patient care.

What about the financial aspect of a teaching and research hospital? In our hospital we receive 50 to 60 per cent of our operating costs from patients. I believe that the balance of the cost of patient care *per se* should come principally from endowment and tax dollars. As physicians we should take responsibility for molding legislation in this regard. In the area of teaching and research, tax dollars should be supplemented by voluntary contributions. Our annual campaign to the community is solely for our teaching and research fund. Our relatively large full time staff has been developed principally through this annual giving campaign and other nonhospital nonmedical school funds. This annual campaign also serves as a form of lay education. The funds available through this annual giving provide a basic fund that helps to pay for key staff members who, in turn, get financial grants from various sources. In the operation of our teaching and research fund, we maintain twice the annual salary of each person who is paid either from it or from other nonuniversity funds. This reserve is our contingency fund.

In closing, I am confident that there is the potential in this city to develop as good a children's hospital as exists or will exist anywhere. You

may be sure that you have the interest and confidence of the pediatric world in your continued growth now under the leadership of Dr. Parrott. He on his part, I am certain, will find constant need to turn for guidance to those of you who, like our honored guest of this evening, Dr. Copeland, have brought this hospital to its present respected position.

A Pediatric Approach to the Feet and Legs

JOHN TKACH, M.D.*

The foot is probably the hardest worked part of the body. Although it tolerates ordinary abuse well, it sometimes inherits defects, frequently is injured and occasionally becomes the target of disease. It is the physician's responsibility to protect the foot and to nurture its proper development so that when full stature is attained the individual will have adequate feet to stand upon. The work of most people demands that they be on their feet much of the time. Therefore adequate feet are important not only to the physical well-being of the individual but also to his economic welfare.

The functions of the foot are to serve as a support for the weight of the body and to act as a lever in propelling the body in walking and running. The muscles of the leg supply the power, and the heads of the metatarsal bones serve as a fulcrum on which the weight is lifted.

Anatomy of the Normal Foot

The foot contains two main arches formed by bones and supported directly by ligaments and indirectly by tendons and muscles. The longitudinal or long arch is made up of two components, the medial and the lateral. The medial component is the more important and comprises the os calcis (calcaneus), astragalus (talus), scaphoid (navicular), the three cuneiform bones and the first three metatarsal bones. The arch rests on the os calcis and on the head of the first metatarsal. The lateral component of the longitudinal arch consists of the os calcis, the cuboid and the fourth and fifth metatarsal bones, and rests on the os calcis and the heads of the fourth and fifth metatarsals. This archlike arrangement absorbs shock, gives strength, elasticity and rhythm to the stride and makes possible a smooth transfer of weight from the hindfoot to the forefoot, and from one foot to the other. If the bones of the long arch are distorted in size and

* Formerly Assistant Chief Resident, Children's Hospital.

shape, the transmission of power through the foot is impaired and efficiency is lost.

The transverse, metatarsal or anterior arch is formed by the heads of the five metatarsal bones. The transverse arch is not as apparent as the long arch and is best demonstrated by placing both feet together. It is then seen that there is a gradual slope across the foot from the base of the fifth metatarsal upward and medially to the base of the first, where the apex of the transverse arch is reached. The transverse arch adjusts the foot to different types of walking surfaces and thus increases stability.

All the bones that make up the arches of the foot are intricately interlaced with ligaments of tremendous strength. The foot is supported by static and dynamic forces. The bones and ligaments provide static support, and the muscles which pass anterior and posterior to the medial malleolus and are inserted into the bones which make up the highest segment of the long arch transmit the tonic power of the tibial muscles which reinforces the arch from below. The peroneus longus muscle swings below the lateral malleolus across to its insertion into the base of the first metatarsal on the plantar surface of the foot; in so doing, it slings the long arch from below and helps to prevent the transverse arch from spreading out. The intrinsic muscles of the plantar aspect of the foot supported, by the plantar fascia, function to truss up the arches from below.

The body weight is transferred through the legs to the feet, each foot receiving one-half the load. In the foot itself, the weight is supported as by a tripod, the legs of which are the calcaneus, the two sesamoids under the first metatarsal head, and the heads of the two lateral metatarsals. The weight borne by the hindfoot equals the weight placed upon the forefoot. However, when shoes are worn the proportion carried by the forefoot increases as the level of the heel is raised.

The ankle joint, the subastragalar joint and the midtarsal joints provide the movements of the foot and ankle. The ankle joint permits plantar flexion and dorsiflexion of the foot. The foot is inverted or in the varus position when it is so rotated that the plantar surface faces medially; the foot is everted or in the valgus position when the plantar surface is rotated outward. Inversion and eversion occur in the subastragalar joint (between the astragalus and navicular, and between the os calcis and cuboid). The primary motion of the midtarsal joints, however, is adduction or inward swinging and abduction or outward swinging of the anterior portion of the foot. Pronation of the foot is a combination of eversion and abduction; supination is a combination of inversion and adduction.

At birth the baby's foot is made up of almost equal parts of bone and soft tissue. This proportion changes rapidly as the child grows, and by the time growth is completed the foot consists of 90 per cent bone and 10

per cent soft tissue. In the newborn the os calcis, astragalus, metatarsals and most of the phalanges are ossified. The navicular, cuneiforms and cuboid are usually cartilaginous and are soft and pliable. The navicular and the cuneiforms make up the highest segment of the long arch. In the mechanics of weight bearing these soft bones are subjected to great stresses and strains and are molded by these forces. The foot of the infant is only the immature antecedent of the adult foot and must develop in numerous ways to reach postural maturity. The bony framework of this young foot must be strengthened by the addition of more bone; the ligaments and muscles must develop the great strength required to maintain the arched structure of the foot against body weight and the added stresses of walking, running and jumping. The neuromuscular units must attain the proper functioning of the reflexes necessary for the propulsion of the body. The highly complicated nervous system, correlating all parts into coordinated movement, must also reach functional maturity.

Physiological Variants of Legs and Feet in Infancy and Childhood

The normal legs and feet of the newborn infant appear grossly abnormal when judged by adult standards. The legs of the newborn infant are usually bowed and the feet are usually in the adductor varus (supinated) position. His normal foot is relatively fatter and wider than that of the adult; it seldom has a distinct longitudinal arch and it never has a transverse arch. The longitudinal arch is usually obscured by a fat pad which causes the medial border of the foot to be straight and causes the foot to appear flat ("physiologic flat foot"). This appearance is accentuated by the physiologic softness and elasticity of the muscle normally present in infants.

If the adduction or supination of the infant's foot is marked, a deformity may be present. The normal adduction and supination which is usually of a lesser degree correct spontaneously. The infant strengthens his lower extremities first by kicking, later by crawling, standing and walking, first with support, then without; each new skill continues the strengthening process. Standing and walking should not be urged until the child is ready to do so voluntarily. The weight of the child, the strength of the lower extremities, the development of equilibrium and confidence determine when the child is ready to walk. Ordinary activity supplies the best exercise for developing the strength without making undue demands of the child.

When a child first begins to stand and walk, his balance is poor. He therefore assumes a broad-based stance and gait; his legs and feet rotate out and, as his ligaments and muscles are still weak, his feet pronate; there is a slight valgus of the heel. The long arches flatten and the knees in time develop a slight valgus (knock-knee) deformity (valgus, "out;" varus, "in"—these terms refer to the portion of the extremity distal to the par-

ticular joint; note that "gus" in valgus and "out" have three letters each, and "us" in varus and "in" have two letters each—this helps to remember which is which).

The child just beginning to walk walks with a clumsy, flatfooted gait and has little spring in his step. Gradually as the strength of the muscles and ligaments increases and the coordination improves, the valgus at the knee and ankle decreases, the out-toeing lessens and a narrower base is acquired. The fat pads disappear with the other fat pads of the body at about 18 to 24 months. About the same time the child develops heel-toe walking, rises on his toes with each step and has a spring to his gait. With this increased efficiency in walking he appears more graceful.

By 5 years of age, development should have progressed to the point that knee and ankle valgus have disappeared and the legs are straight. Pronation is no longer present. The foot and leg have an appearance approaching that of the normal adult. If supination, genu varus, pronation or genu valgus are present, they are abnormal.

Thus alterations that were considered normal earlier must be regarded as deformities if they exist after the age of five. However, throughout childhood it is a matter of judgment on the part of the physician whether or not the position of the foot conforms to that of a normal child of the same age. Just where to draw the line between alterations within the limits of normal and true deformities is often a matter of degree and depends on the judgment of the clinician; to understand the various aspects of the normal foot, it is necessary to consider some of the abnormalities of the foot and leg so that the clinician can better judge what is normal

The Normal Gait

The infant begins walking with a wide-based gait and a waddle; his coordination is primitive and he has a great deal of uncertainty. At first he walks a short distance, rests, then tries again. In this way he practices frequently, yet avoids strain. With practice the gait improves. The optimal gait is one that is graceful and requires the least effort.

In well developed walking, the foot is placed forward in dorsiflexion with the heel resting on the floor. The weight rolls over the heel. The posterior leg muscles contract to bring the anterior part of the foot in contact with the floor while the heel is lifted into the air. The foot acts as a lever with the fulcrum at the talus, and the posterior projection of the calcaneus acts as a short lever upon which the powerful leg muscles exert their force. The flexor muscles of the toes contract and cause the toes to grip the floor and propel the body forward. At no time during normal gait is the entire foot flat on the floor.

Under normal conditions walking consists of a light or rolling gait.

This means that the heel strikes the ground first on the outer side; thus the weight is first transferred forward on the outer side of the foot. It then crosses over the heads of the metatarsal bones to the inner side of the foot onto the head of the first metatarsal bone; at that moment the body weight is supported by the great toe assisted by the four lateral toes, and is finally propelled over the toes. The motion is screwlike, first going along the lateral side forward, then medial to the great toe. Just before the toes of one foot leave the floor, the other foot is swung forward and the body weight shifted to that heel. Then again the body weight is transmitted from heel to toe. The foot turns neither in nor out. The feet should not cross nor be too far apart.

Physical Examination of the Feet and Legs

Examination of the patient's feet and legs to be complete demands that the patient be examined in three positions where indicated and possible: lying, standing and walking. In the recumbent position leg lengths and contours are noted, and the tone of muscles and ligaments is appraised; foot contours and position are noted, and the presence of lesions such as corns or calluses is also observed. The range of motion of the hips and knees is tested. If there is any deformity, its severity is defined by obtaining the maximum amount of correction. To check the various joints of the foot, the movements of dorsiflexion, plantar flexion, abduction, adduction, pronation and supination are examined. In dorsiflexion of the foot, the foot should always be slightly inverted before being dorsiflexed. Tight heel cords may be missed otherwise. Inversion locks the heel, and tension then can be put on the heel cord; if the heel is not locked by inversion it swings into eversion, and little if any tension is put on the heel cord with dorsiflexion. With inversion and dorsiflexion, the normal foot should easily come up to 30 degrees above neutral position.

In the infant, diagnosis of foot deformity is made by inspection and gentle manipulation. The legs of the normal infant are usually bowed, and his feet in an adductor varus position. If the foot is in a position of deformity, gentle pressure is applied to correct the deformity. If it corrects easily, it is probably due to position *in utero* and will require no treatment; if the deformity will not readily correct passively, it is a true deformity.

In the older cooperative child, a muscle evaluation can be helpful and can be completed rapidly by asking the patient to resist the examiner's pull with the foot held in dorsiflexion, plantar flexion, inversion and eversion. Reflexes can be checked, and a sensory examination can be done if indicated.

The standing child is inspected both from the front and back. He stands in his bare feet, which are held about six inches apart and toed straight

ahead so that their medial borders are parallel. The longitudinal arch, foot alignment, ankle and heel position, and tibial alignment are checked. The bowed legs of the infant with fat pads obscuring the longitudinal arches have already been mentioned, as have the broad base, knock-knee, slight pronation, etc. in the preschool child. A normal weight-bearing foot in the older child presents a good longitudinal arch with no evidence of pronation. The toes are well spaced and straight and lie flat; the forefoot is well aligned on the rearfoot; the average posture on standing is a position of out-toeing of about 15 degrees. The ankles do not bulge internally or externally, and the foot as a whole is straight forward and properly aligned on the leg. An imaginary plumb line dropped from the superior iliac spine will pass through the center of the patella and through the second toe. The presence of in-toeing or out-toeing, and of knock-knee or bowlegs is observed.

The position of the heel can best be evaluated from behind. By following the direction and course of the heel cord to its insertion into the os calcis, the position of the os calcis is revealed. In the normal foot the heel cord drops perpendicularly into the os calcis. Valgus and varus deformities of the heel can occur.

Observation of the walking child wearing his shoes completes the examination. The child with a normal gait toes straight ahead, walks a heel-toe stride, has a good take-off, coordinates the swing of his arms with the motion of his legs and appears graceful.

Lastly, examination of the shoes may assist in analyzing a foot problem or a gait defect. Abnormal wear on the heels and soles, broken down counters and misshapen shanks are points to be observed and evaluated.*

Structural Deformities of the Foot and Leg

It is important to remember that in most instances the normal developmental sequence of the lower extremity is from mild bowing to mild knock-knee to normal alignment. The ages of transition are variable and are influenced also by the child's body type. The fat child is more likely to develop knock-knees earlier. As previously mentioned, children are born bowlegged and remain bowlegged until about 2 years of age; they then become knock-kneed and remain so until about 5 years of age. The legs then usually become straight. With the bowlegged child in the bowlegged stage, the question may arise, is the bowing normal or excessive? A similar problem can arise with the knock-kneed child in the knock-kneed stage.

With bowlegs and knock-knees it is necessary first to follow the child to see if there is progression of severity; it is very rare that severity is so

* The counter is the support in the posterior part of the shoe and the shank is that part of the shoe under the mid foot.

great when seen initially that treatment need be instituted without follow-up examination for evidence of progression. When to refer the child to an orthopedist depends on the pediatrician's experience.

To get a baseline for future evaluations the child is instructed to sit with his legs extended. If he is bowlegged, his medial malleoli are brought together, and the distance between his medial femoral condyles is measured and recorded; if he is knock-kneed, the medial condyles are brought together, and the distance between his medial malleoli is measured and recorded. The greater the distance between the malleoli, the more severe is the knock-knee deformity. Some orthopedists check at three month intervals. If the degree remains the same, no treatment is necessary; if the degree increases, treatment may be necessary. Sometimes a child may be followed for six to nine months before a decision is made. In the interim, wedges may be used. When treatment is necessary, correction is accomplished by shoe, brace, plaster or surgery (osteotomy); the treatment used depends on the severity of the deformity and its progression.

When these conditions are present, it is necessary to keep in mind the physiologic stages of leg positions. Knock-knees in a 1 year old is not physiologic; therefore its presence should prompt an investigation for etiology. Bowlegs in a 5 year old likewise should arouse suspicion.

Tibia vara (Blount's disease) occurs when growth does not take place normally in the medial aspect of the tibial epiphyseal plate, and can be a cause of bowlegs. Rickets must always be considered in the differential diagnosis of pathologic bowing of the legs as well as pathologic knock-knees.

In-toeing can be the result of a defect at three levels: the foot (at the midtarsal joints), the knee or the hip; the resultant deformities are metatarsus varus, internal rotation of the tibia (tibial torsion) and internal rotation of the femur (femoral torsion). These deformities usually become evident at 4 to 6 months of age; metatarsus varus is the most frequent deformity.

Metatarsus varus is an adductor deformity of the forefoot. When it is present the forefoot cannot be brought to the anterior midline position if the hindfoot is held in a fixed posterior midline position. *In utero*, the foot cannot be held in a neutral position; it is therefore held either in adductor varus or in calcaneovalgus, the latter being much less frequent. Some degree of metatarsus varus is physiologic and straightens out usually by 2 to 2½ months; the correction can be assisted with gentle corrective massage by the mother. If the forefoot has not physiologically derotated by 3 to 4 months, orthopedic consultation should be obtained. The pediatrician should warn the parents that a plaster cast, which is the quickest way to achieve derotation, may be necessary.

In checking for tibial torsion the infant's knees should be flexed and the

position of the foot inspected; if internal rotation of the tibia is present, the whole foot will be in the pigeon-toed position. An infant is born with about 20 degrees of internal tibial torsion; it should correct in the first year. Flexing the infant's knees also relaxes the feet and makes their evaluation easier. The *outer* edge of the foot should be observed. If it is straight, no metatarsus varus is present.

Another way of differentiating metatarsus varus from internal tibial torsion is by placing the child in the supine position and positioning the leg so that the patella is in midline. If metatarsus varus is present the forefoot will be in adduction while the hindfoot is in line with the patella: if internal tibial torsion is present, the forefoot and the hindfoot will be in the pigeon-toed position and not in line with the patella.

A further method of evaluating tibial torsion is having the child sit with his legs extended. The examiner points the child's foot perpendicular to the surface on which the child is sitting, then observes the position of the patella. If it is in midline, no rotation is present; if the patella lies medial or lateral, rotation is present.

In examining for rotational defects of the hips the child lies with his legs extended; the examiner rotates the entire leg first in and then out to see if limitation is present in either direction. Usually the leg can be rotated more externally than internally. An abnormal internal rotation of the femur can cause the entire leg and foot to swing in and cause a pigeon-toed deformity. If an attempt at compensation is made and the foot does not swing in, a pronation deformity may be the result. In a similar manner, external rotation of the hip can contribute to a supination deformity.

When a child first begins standing and walking, some out-toeing or in-toeing may be present and may be due to a lack of coordination in his newly acquired abilities. Therefore, if no apparent metatarsus varus or tibial or femoral torsion are present, the child should be re-evaluated after he has been walking on his own for two or three months; then his coordination will be better, and a truer evaluation can be made. If the in-toeing of an infant due to tibial torsion is severe or if the in-toeing of one foot is greater than the other, Dennis-Browne splints are used. In a child whose tibial torsion is slight and who has been walking on his own for two months, either no treatment or a $\frac{3}{16}$ inch outer sole wedge may be used. The outer sole wedge acts as a pivot and causes the foot to turn out. An aid in remembering the direction of pivoting is: *an outer* sole wedge turns the foot *out*. Actually such a shoe does not help much as the deformity is in the knee and not in the foot. Therefore, if the in-turning is marked, the wedge may be used during the day, but Dennis-Browne splints with legs placed in external rotation must be used at bedtime and at naptime.

Out-toeing may be due to external rotation of the tibia or external

rotation of the femur. Oftentimes a child is brought to an orthopedist for out-toeing but the deformity is in in-toeing of the other foot. Severe out-toeing is rarely seen. Generally speaking, a foot that turns out is better than one that turns in, because a position of in-toeing puts greater strain on the foot and leg when walking or running.

External rotation of the hips is due to contracture of hip external rotators. Dennis-Browne splints which keep the legs in internal rotation are used to correct the deformity. The amount of internal rotation prescribed is increased with time. If the external rotation is severe a cast may be necessary. The incidence of internal and external rotation of the hip is about equal, according to some observers' experience.

SUMMARY

The foot is probably the hardest worked part of the body. It is the physician's responsibility to protect the foot and to nurture its proper development so that when full stature is attained the individual will have adequate feet to stand upon. Adequate feet are important not only to the physical well-being of the individual but also to his economic welfare.

To fulfill his responsibility the physician must first appreciate what constitutes the normal foot and leg. This paper attempts to describe the normal anatomy of the foot with particular stress on the arches and joints, the developmental patterns of the infant's feet and legs, and the development of normal gait. What constitutes a good examination of legs and feet is described; this includes a description of the feet and legs of the older child. The recognition and treatment of structural deformities of the feet and legs, including bowlegs and knock-knees, and deformities producing in-toeing and out-toeing are discussed.

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Herpetic Gingivostomatitis and Necrotizing Ulcerative Gingivitis in the Child and Adolescent

SPENCER N. FRANKL, D.D.S.*

During routine and emergency examination of patients in the Dental Clinic of the Children's Hospital of the District of Columbia from July 1958 through June 1959 a variety of viral, bacterial and mycotic oral lesions were encountered. These infectious processes varied from simple poor oral hygiene and eruptive gingivitis to herpetic, monilial, and ulcerative lesions. Fortunately many of these conditions were of a self-limiting nature or were quickly managed by the correction of faulty oral hygiene and the institution of proper home care. However, some of these stomatitides required intensive local and systemic therapy. Two of the more frequently encountered and misdiagnosed of these oral infections were the acute forms of herpetic gingivostomatitis and necrotizing ulcerative gingivitis.

Herpetic gingivostomatitis is characterized by formation of individual or multiple vesicles.[1] The presence of such vesicles aids considerably in the diagnosis of the disease; however, they rupture early, and the majority of the patients examined exhibit the resultant ulcerations. The gingival tissues surrounding the ulcerations are hyperemic and have a definite tendency to bleed at the slightest trauma. Common ulcer sites are at the junction of the buccal mucosa and attached gingiva; the lips, the palate and the sides of the tongue are also frequently involved (table 1). Most of the 24 children treated were in extreme general discomfort, which was manifested by crying, irritability, anorexia and fever. The rectal temperature ranged from 100 to 104°F. depending on how soon the patient was

* Formerly Dental Resident, Children's Hospital.

examined after onset of the condition. Profuse salivation with drooling was common and frequently caused chafing of the corners of the mouth and chin. Less frequent findings were foetid mouth odor and regional lymphadenopathy.

The course of the disease varied in length from five days to two weeks, disappearance of the lesions usually occurring in 8 to 10 days. In one child the lesions persisted for 12 days, but complete remission occurred in the next two days. None of these 24 patients was beyond 4 years of age (table 2).

Although herpetic gingivostomatitis is a self-limiting disease,[2] palliative and supportive therapy is essential. The primary concern of the clinician is the need for proper fluid intake. Due to the extreme soreness of the mouth, the child often refuses fluids; careful selection of the type of beverage offered is therefore important. Bland, cooled liquids including milk and

TABLE 1

Location of Vesicles or Ulcers in the Mouth in 24 Patients with Acute Herpetic Gingivostomatitis

Site	Number
Junction of Buccal Mucosa and Attached Gingiva	21
Lips	14
Tongue	9
Palate	4
Labial or Lingual Frenum	2

TABLE 2

Age of 24 Patients with Acute Herpetic Gingivostomatitis

Age	Number of Patients
9 to 10 months	2
10 months to 3 years	19
3 to 4 years	3

TABLE 3

Age of 14 Patients with Acute Necrotizing Ulcerative Gingivitis

Age	Number of Patients
12 years	1
13 years	6
14 years	5
15 years	2

water are generally accepted. Citric juices, due to their acid quality, are to be discouraged since they are painful to the open lesions. Jello, ice cream, and custards may also be substituted. None of the patients in this group required hospitalization for parenteral fluids.

Successful treatment of the local lesions is extremely difficult. Topical applications of caustics or aniline dyes are not used since the affected mucous membranes are made more painful and tender. In the children in the present series, maple syrup or Karo® syrup was applied by cotton applicator or administered by teaspoon. Bland mouthwashes of warm water and saline were employed by the older children; the profuse salivation of the 1 and 2 year old group tended to keep the lesions clean. Anesthetic lozenges were beneficial in the more severe cases.

Necrotizing ulcerative gingivitis is an inflammatory disease of the gingiva which is also characterized by necrosis and ulceration.[3] The destructive nature of this condition is most clearly evidenced in the interdental papilla where ulcer formation causes a hollowed or punched-out appearance. Fourteen patients were observed at the Dental Clinic, all of whom presented papillary involvement occurring especially around the erupting second permanent molar, together with pain, hemorrhage, profuse salivation and foetid breath. Frequently the patient presented a raw red bleeding area where the membranous ulcerated areas had been torn away. An elevated temperature (ranging from 99.3 to 103°F.) and general malaise were the outstanding systemic findings. No patient displaying the infection was under 12 years of age when diagnosed (table 3).

Some investigators believe that this condition results from the oral flora undergoing changes in puberty and therefore providing a better environment for inflammation to develop. However, this hypothesis has not yet been substantiated. Necrotizing ulcerative gingivitis in the deciduous dentition (under 6 years of age) is nonexistent or extremely rare.

In all of the patients observed, there were two main local contributing factors evidenced: poor oral hygiene and erupting teeth. Excessive amounts of retained food, supragingival and subgingival calculus and decalcified tooth structure were commonplace. Unfortunately the painful nature of the condition resulted in no appreciable effort of the patient to improve this unhygienic environment. Erupting second permanent molars and bicuspids provided excellent areas for food retention which aided considerably in lowering tissue resistance. The majority of patients were generally well developed physically; further investigation, however, usually revealed an unbalanced diet almost devoid of roughage but including excessive starches and sugars.

Initial therapy consisted of conservative tooth scaling, with removal of easily displaced coronal calculus and soft deposits. This initial scaling

involved no subgingival manipulation. Mouth rinses of warm saline or one part hydrogen peroxide to three parts warm water repeated six to eight times daily were instituted immediately. Intramuscular injections of 600,000 units of procaine penicillin were administered for three successive days; the final injection was of the "long acting" type. Therapeutic dosages of multiple vitamins and diets consisting of fruit juices, hot cereals, eggs, chopped meat and cooked vegetables were prescribed. Further scaling and subgingival currettage were continued in the succeeding 24 to 48 hours after the initial visit. Topical anesthetics and anesthetic lozenges were employed to control discomfort during gingival manipulation. Substantial improvement was seen in the second to third visit (24 to 48 hours), but further soft tissue and root currettage continued for three or four further visits (10 to 14 days).

CONCLUSION AND SUMMARY

Herpetic gingivostomatitis and necrotizing ulcerative gingivitis are frequently seen in children. Similarities in the oral and systemic manifestations of these two conditions lead to misdiagnosis and faulty therapy. Of the 24 patients treated for herpetic gingovostomatitis at the Dental Clinic of Children's Hospital, the oldest child was 4 years of age; in contradistinction, the youngest patient treated for necrotizing ulcerative gingivitis was 12 years of age. This observation aids in illustrating that necrotizing ulcerative gingivitis is primarily a disease of the adolescent, while most attacks of primary herpetic gingivostomatitis are seen in the preschool child. The lesions of herpetic gingivostomatitis are seen throughout the oral cavity while those of necrotizing ulcerative gingivitis are seen primarily in the papillary and marginal gingiva. Both conditions demand prompt yet dissimilar therapy.

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